Ontario

Air Quality and Climate Change

Insights • Opportunities • Solutions

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AIR QUALITY AND CLIMATE CHANGE
Insights – Opportunities – Solutions

Fossil fuels like oil, coal or natural gas are the very engines that drive Ontario's economy and way of life. We use them to power our cars, to generate part of our electricity, to heat and cool our homes and offices. They are a vital contribution to the outstanding quality of life Ontarians enjoy.

In any society, the widespread use of fossil fuels goes hand in hand with a responsibility to avoid, reduce and manage their harmful emissions: microscopic particles and gases like nitrogen oxides (NOx), sulphur dioxide (SO_2) or carbon dioxide (CO_2) – in short, air pollution.

Ontario has been very successful in managing air pollution. Ontario's Air Quality Index reports good to very good readings 95.5 per cent of the time. Current programs like Drive Clean, Smog Patrol and the provincial Anti-Smog Action Plan are improving the air we breathe. Through our comprehensive Smog Alert and Air Quality Ontario programs, Ontario municipalities and individuals have the tools they need to quickly and effectively respond to air quality concerns. A new website at **www.airqualityontario.com** provides Ontarians with up-to-date air information and suggested actions in case of poor air quality.

But more work needs to be done. With the help of all Ontarians, the government is fully committed to do more and will continue to broaden and intensify its campaign for clean air.

One pollutant – Several points of impact

Minimizing air pollution is a big challenge. The gases that pollute our air are like a large set of building blocks, where one basic process can generate gases which contribute to a number of air pollution challenges, including smog, acid rain, and even climate change.

Nitrogen oxides (NOx), for example, are such air pollution chameleons. A family of generally colourless and odourless gases, nitrogen oxides are emitted from combustion processes taking place in motor vehicles, power plants, incinerators and a wide range of industries. They shift shape in combination with other chemicals to form a variety of air pollution compounds.

In the presence of sunlight, nitrogen oxides combine with volatile organic compounds (VOCs) – chemicals that readily evaporate and are released by automobiles, industry and our daily use of paints and solvents. The result is ground-level ozone (O_3). Ozone is a major component of smog, which is known to many Ontarians as the brown haze that can spoil a perfect summer day. Other than ozone, smog is made up of sulphur dioxide (SO_2), inhalable particles and many other pollutants.

The harmful effects of nitrogen oxides continue when the gas recombines in the atmosphere to form a complex mix of acidic compounds – a component of acid rain. Acid precipitation in the form of rain, snow, or even fog leads to the acidification of lakes and soils. Even physical structures like buildings or bridges can feel the corrosive effects of acid rain.

Last but certainly not least, some nitrogen compounds also contribute to climate change.

Transboundary air pollution – A nasty import

Common harmful air pollutants like nitrogen oxides and sulphur dioxide are not only shape-shifters, but also frequent flyers. Ontario's emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) pale when compared to those from eastern US states. Carried by prevailing wind patterns, a whopping 50 per cent of Ontario's air pollution is blown across the border from US sources. This means that Ontario's smog, acid rain and climate change problems are as much imported as they are home-made. This fact has important consequences for Ontario's strategy to combat air pollution and its many symptoms. Since we share our airshed with our neighbours in the US, all efforts to combat smog, acid rain and climate change depend on US cooperation to be effective.

"Two birds, one stone"

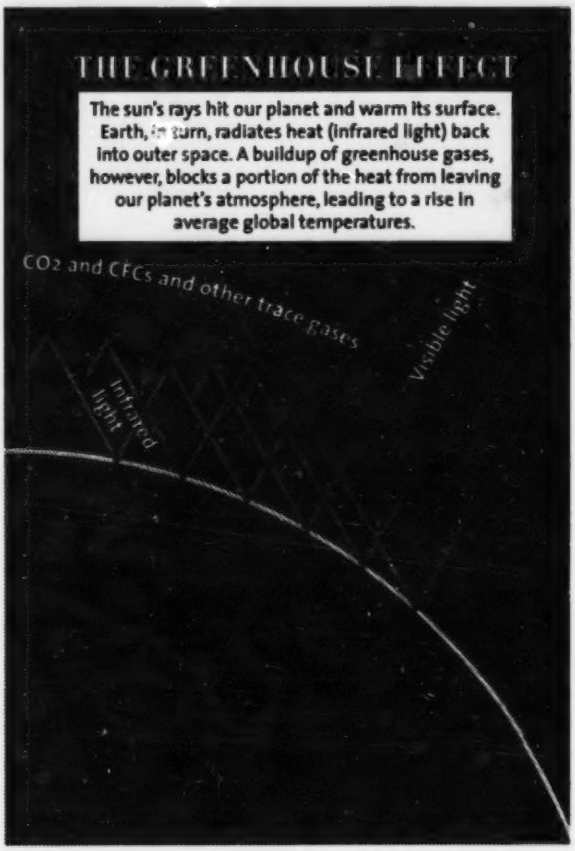
Air pollution phenomena like smog, acid rain or climate change are largely the result of a limited number of major airborne pollutants (NO_x, VOCs, SO_2, CO_2). The combustion of fossil fuels, however, produces air contaminants from a large variety of sources. This presents both an opportunity and a challenge.

The opportunity: Since it is often the same processes that cause smog, acid rain, or contribute to climate change, targeted reductions of a single process can produce a multitude of benefits. By reducing nitrogen oxide emissions, for example, smog, acid rain and greenhouse gas emissions are also reduced. Another example: Improving the efficiency of a single combustion process which achieves a reduction in major pollutants can in turn lead to a reduction of toxic substances like benzene or mercury. These co-benefits enable a specific emissions reduction strategy to be the proverbial stone that gets the two birds.

The challenge: Since there are innumerable pollution sources that exist in the airshed Ontario shares with its neighbours, emission reduction strategies have to be broad in scope. The challenge of scope looms particularly large in the fight against climate change, one of the most pressing environmental concerns of our time.

Climate change – A risk to our environment

One of the most troubling atmospheric challenges created by our dependency on fossil fuels is the 'greenhouse effect' and its alter ego, climate change. Our cars and sport utility vehicles, industry, agriculture and power stations are all sources of greenhouse gases. The most potent greenhouse gases are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), all of which are associated with fossil fuel use. Burning one single litre of gasoline, for example, creates 2.4 kg of carbon dioxide.


THE GREENHOUSE EFFECT
The sun's rays hit our planet and warm its surface. Earth, in turn, radiates heat (infrared light) back into outer space. A buildup of greenhouse gases, however, blocks a portion of the heat from leaving our planet's atmosphere, leading to a rise in average global temperatures.
CO2 and CFCs and other trace gases
Visible light
Infrared light

Greenhouse gases trap the sun's energy – much like the glass roof of a greenhouse would – and prevent heat from escaping into outer space. The higher the concentration of greenhouse gases in our atmosphere, the warmer Earth gets. In turn, warmer temperatures, particularly at the equator or the poles, impact weather cycles, vegetation, eco-systems, etc. – in short, we get changes in climate. Since the beginning of the industrial era, the levels of carbon dioxide and nitrous oxide in our atmosphere have both increased by 13 per cent, while methane is up 146 per cent.

Although the connections between atmospheric warming, climate change and specific weather events are very complex and hotly debated, the balance of evidence shows that there is an important environmental risk to be avoided.

For Ontario, the risk includes serious, more frequent severe weather events such as thunderstorms, ice storms, tornadoes, floods or droughts. Rising temperatures could also lead to a drop in the Great Lakes' water levels, which would reduce the water supply to municipalities and their industries. Even our forests could be affected, suffering more fires, insects and disease thanks to increased average temperatures.

Rising temperatures could also drive wildlife further north in search of a climate it is accustomed to. Species that do not adapt quickly enough risk extinction. Not least of all, the incidence of hot weather-related health problems such as heat stress and poor air quality days could see a rise, while there is also an increased risk of tropical diseases spreading further north.

Taking Action Now

What is Ontario doing about climate change?

Ontario is a leader in combating smog, acid rain, and greenhouse gases. Ontario has acknowledged the risk and has decided to make the fight for cleaner air and the prevention of climate change top government priorities. While many levels of government and indeed many countries are struggling with the international issue of climate change, Ontario is acting now – for the benefit of all Ontarians.

The Ontario Government is actively engaged in the fight against climate change through many clean air actions, which yield climate change and other clean air benefits.

Ontario has led the way by bringing its own house in order first. Preliminary studies confirm government operations have reduced greenhouse gas emissions by approximately 40 per cent since 1990. Other programs have catapulted Ontario to the forefront of the battle against climate change:

- Increasing momentum in the fight against climate change, Ontario has invested $10 million through its Climate Change Fund to develop the next wave of provincial actions and stimulate all sectors – governments, industries, communities and individuals – to search for the most effective ways to reduce greenhouse gas emissions.

- Government programs like Drive Clean and Smog Patrol are already doing their part by targeting vehicles that are heavy polluters because of poorly maintained engines, or those that operate without properly functioning emission control equipment. The exhaust of our vehicles is the source of 29 per cent of all greenhouse gas emissions, chief among them carbon dioxide. By reducing emissions right at the tailpipe, Ontario is also lowering smog levels and acid rain precipitation. The numbers: Drive Clean is expected to cut CO_2 emissions from vehicles by 100,000 tonnes annually – the equivalent of permanently taking 23,000 cars off the road – while also reducing smog-causing emissions by 22 per cent when fully implemented.

- Ontario's Anti-Smog Action Plan (ASAP) is not only committed to reducing smog-causing emissions by 45 per cent. It is also a climate change fighter. Ozone, while being the main ingredient of smog, has also been identified as a greenhouse gas.

- Methane is a greenhouse gas produced when organic matter decomposes without the presence of oxygen. Its contribution to the greenhouse effect is second only to CO_2. In order to lower methane emissions to our atmosphere, Ontario was one of the first Canadian jurisdictions to regulate landfill emissions. Again, there are co-benefits to this measure. Ground-level ozone production from VOCs and some toxic chemicals is also reduced.

- Ontario's building code is among the best and most energy efficient in Canada. Less energy used at home or in the office translates into fewer greenhouse gas emissions produced by furnaces and regional electricity providers.

- Even small details make a difference: Intelligent transportation systems such as the COMPASS program and the 407 Express Toll Route play an important role by reducing traffic congestion and therefore vehicle emissions. COMPASS is a freeway traffic control system developed by the Ontario Ministry of Transportation. It informs drivers of the latest traffic conditions through changeable message signs. Such systems hold great promise for future emissions reductions.

- Ontario's Energy Efficiency Act for appliances and consumer products reduced carbon dioxide emissions by an estimated half million tonnes in 1999. This number is expected to rise to 1.6 million tonnes annually by 2020. In the 12 years since the Act was introduced, the accumulated energy savings would be enough to power the cities of London and Windsor for one year.

- Government support for new agricultural practices such as conservation tillage – where fields are left undisturbed from harvest to planting – will result in a net reduction of agricultural greenhouse gas emissions due to a reduced use of heavy farming machinery and the increased absorption of carbon-carrying plant material into the soil.

- Forests absorb greenhouse gases from our atmosphere as well. Ontario has introduced innovative forest management practices that protect trees by reducing the risk of damage due to fire, insects and disease.

- Responding to increased federal abandonment of rail branch lines, the Ontario Shortline Railways Act makes it easier for businesses to establish their own rail operations. Since 1996, 11 new shortline railways in Ontario have taken on the freight load of thousands of trucks, significantly reducing greenhouse gas emissions, smog and acid rain.

Increasing momentum – Innovative new ways to combat climate change

- Opening Ontario's electricity market to competition will enable renewable energy sources and high efficiency gas-fired generation to be brought on-stream. Consumers will be able to choose electricity from sources that produce the lowest greenhouse gas emissions. Generation projects relying on clean, low-emission generation sources amounting to $3 billion have been proposed since the passage of the Energy Competition Act.

- In its move to open up electricity markets, the Ontario Government is putting the environment first. Through a combination of tough regulation and market mechanisms, Ontario is tightening emissions limits and paving the way for clean power generation. We are opening up our electricity system and giving green generators open access to sell their power.

- On January 24, 2000, a series of tough air protection measures were announced, including a requirement that all industrial and commercial sectors monitor and report harmful air emissions, including greenhouse gases and many substances depleting the protective ozone layer in our stratosphere. Electricity sector reporting began on May 1, 2000.

- Tough new limits have been announced for emissions of nitrogen oxides (NO_x) and sulphur dioxide (SO_2). Limits will apply to the electricity sector first and later extend to other industrial sectors. Stringent limits on NO_x and SO_2 will also help curb CO_2 emissions.

- The Ontario Government announced emissions performance standards that will apply to all electricity sold in Ontario. This initiative sets a maximum level of air pollution that is allowed to accompany electricity generation, denying dirty imported electricity the chance to undermine Ontario's tough new emission limits.

- The Ontario Government has proposed the introduction of an emissions reduction trading program (ERT) for NOx and SO_2. Emissions trading rewards those who take action to reduce emissions below regulated levels by allowing them to create emission reduction credits. These credits can be sold to other emitters to allow them the flexibility to reduce emissions through investments that are timed to also improve their competitive position. This creates strong financial incentives for lowering harmful emissions, including those causing smog and acid rain, and may be applied to reduce greenhouse gas emissions in the future.

- Since more than half of our air pollution comes from south of the border, Ontario is strongly supporting the U.S. Environmental Protection Agency's efforts to implement tough new emission limits. The Ontario Government has gone so far as to make its clean air case before several US courts.

In all its climate change actions, the Ontario Government has been able to build on a strong foundation of voluntary commitments by businesses, municipalities and individuals. The contributions made by a large number of organizations and countless Ontarians are substantial and much more than just a good start.

What are Ontario businesses doing about climate change?

Over 240 Ontario businesses and organizations have registered their reductions of greenhouse gas emissions with the Voluntary Challenge and Registry (VCR). This government-private sector initiative has been encouraging voluntary reductions of greenhouse gas emissions since 1995.

The following success stories illustrate the pro-active stance many Ontario businesses, organizations and municipalities have taken on climate change:

- Ontario Power Generation has spent $1 billion over the last decade to reduce emissions and currently produces the same amount of power from coal as it did ten years ago with 60 per cent fewer emissions of NOx and SO_2. Ontario Power Generation produces 75 per cent of its electricity from sources that do not produce GHG emissions or emissions of NOx and SO_2.

- DuPont Canada Inc. has reduced the greenhouse gas emissions from its nylon production plant in Maitland, Ontario by more than 50 per cent. The company is now working toward a 95 per cent reduction. At its five Ontario manufacturing facilities, DuPont has been able to reduce its overall energy consumption by 28 per cent over 1992 levels.

- Spruce Falls Inc., a Kapuskasing manufacturer of newsprint, specialty paper and lumber, has reduced its greenhouse gas emissions by almost 46 per cent since 1990 through a combination of fuel substitution and modernization projects.

- Dow Chemical Canada Inc., which has one facility in Sarnia and another in Weston, Ontario, reduced its CO_2 emissions by 22 per cent between 1990 and 1998. This was achieved primarily through energy conservation measures.

- Humber College of Applied Arts and Technology has two main campuses in Toronto. As of 1997, the college had reduced its greenhouse gas emissions by 2.5 per cent over 1990 levels. These reductions, for which Humber recently received an award, were due primarily to energy conservation measures such as a lighting retrofit.

- As of 1998, Enbridge Consumers Gas had reduced greenhouse gas emissions by 19 per cent over 1990 levels. This reduction was achieved primarily through process changes such as replacing older cast iron pipes to reduce leakage. The company is also committed to reducing greenhouse gas emissions through demand management initiatives such as offering its customers programmable thermostats.

What are Ontario municipalities doing about climate change?

Sudbury

Sudbury's Land Reclamation Program is restoring natural areas previously used by industry. To date, over 3,200 hectares of land have been restored and over 5.5 million trees planted. Since trees naturally clean the air of carbon dioxide (CO_2), this initiative will offset 70,000 tonnes of CO_2 emissions per year — the equivalent of keeping 1,500 transport trucks off Ontario's roads.

Cornwall

Cornwall Electric built the first co-generation power system in southern Canada with a capacity to produce heat as a byproduct of electrical generation. The system generates about four per cent of the city's electricity needs. Using co-generation for heat and power has reduced fuel consumption and greenhouse gases by up to 30 per cent.

Toronto

The City of Toronto has contracted with power developers to replace some of the coal used in electricity generation with methane — a flammable gas emitted by landfill sites. The methane recovered at the Keele Valley and Brock West landfills eliminates the same amount of greenhouse emissions that a million cars would produce in a year.

Perth

As part of the ecoPerth community project, the Town of Perth has initiated a number of small projects with immediate results: Timers on all downtown Christmas lights, for example, save 4.5 tonnes of carbon dioxide (CO_2) emissions a year. Another initiative, the distribution of 7,000 tree seedlings, is expected to clean the air of 70 tonnes of CO_2 per year once the trees mature.

What are individuals doing about climate change?

People from all walks of life are joining the Ontario government, municipalities, and businesses in the concerted effort to reduce greenhouse gas emissions:

- Thousands of Ontario homeowners have increased the energy efficiency of their homes by installing insulation and energy-efficient showerheads or by weatherproofing doors and windows.

- Ontarians are using energy-efficient lightbulbs, lowering both their utility bills and the greenhouse gas emissions produced by some of our power stations.

- More and more Ontario motorists are driving well-tuned vehicles as a result of the Drive Clean program.

- The Active and Safe Routes to School Program (ASRTS) promotes walking to school and encompasses a "No Idling at School Program" that contributes to lower greenhouse gas emissions and a healthier environment.

- More and more Ontarians are also taking fuel efficiency into account when purchasing new vehicles.

What YOU can do

While the Ontario government has taken the lead in reducing air pollution through focused initiatives, every single one of us has a role to play in cleaning up the air. After all, air pollution is the byproduct of our everyday choices. We can choose to carpool, take public transit, ride a bicycle or walk rather than drive. We can choose to be frugal with our electricity, or buy products that are environmentally-friendly. Air quality is everybody's business, and every little action counts. So choose to be car-smart, energy-smart and product-smart.

Be car-smart!

Try to drive less. In North America, every advance made in clean-air technology for vehicles (e.g. catalytic converters) has been offset by our ever-increasing mileages. In order to cut down on the many harmful emissions that come from our tailpipes — carbon monoxide, carbon dioxide, nitrogen oxides and reactive hydrocarbons — we must use new engine technologies or simply drive less. For short trips and whenever possible, try using public transit. Organize a carpool, or walk or take your bicycle to work. It is also very important to keep your vehicle well-tuned. Emissions from a poorly-maintained car can be up to 30 times higher than those for a car that runs well.

Next generation vehicle technologies and alternative fuels (e.g. electric, ethanol, natural gas/propane and hydrogen) will play an increasingly important role in reducing greenhouse gases.

Be energy-smart!

Roughly 75 per cent of Ontario's energy requirements are met through clean energy. It is produced in the province's wind, water and nuclear power stations, never generating any smog or greenhouse gas emissions. The remaining 25 per cent of our electricity, however, come from burning coal, natural gas and oil. Our fossil fuel power plants produce a number of harmful emissions, chief among them sulphur dioxide (SO_2), one of the main culprits in the formation of smog and acid rain.

In order to reduce these emissions, be energy-smart: Switch off lights you don't use, turn down the air conditioner or the heater and try to upgrade your home's energy efficiency. Even little actions produce large benefits: If only five gas-heated homes lower their thermostat by one degree Celsius, our air is spared over one tonne of CO_2 each year.

Be product-smart!

When purchasing products for everyday use, consider their impact on air quality. Avoid using aerosol sprays and cleaners, oil-based paints and other chemical products that release volatile organic compounds (VOCs) which aid in the production of ozone and contribute to our smog problem. Also, when buying or replacing appliances, insist on energy efficiency. A device as simple and inexpensive as a low-flow shower head, installed in seven homes, can reduce CO_2 pollution by almost a tonne every year.

Sweat the small stuff!

In many Ontario households, the car isn't the only machine powered by a combustion engine. A gasoline-powered lawnmower run for an hour puts out about the same amount of smog-forming emissions as 40 new automobiles. So sweat the small stuff and try to find alternatives to gasoline-powered garden equipment like mowers, trimmers, leaf blowers or chainsaws.

Finding solutions to the combined challenges of air pollution and climate change is everybody's business. The Ontario government has paved the way to a greener future through an ongoing and unprecedented campaign of air quality initiatives.

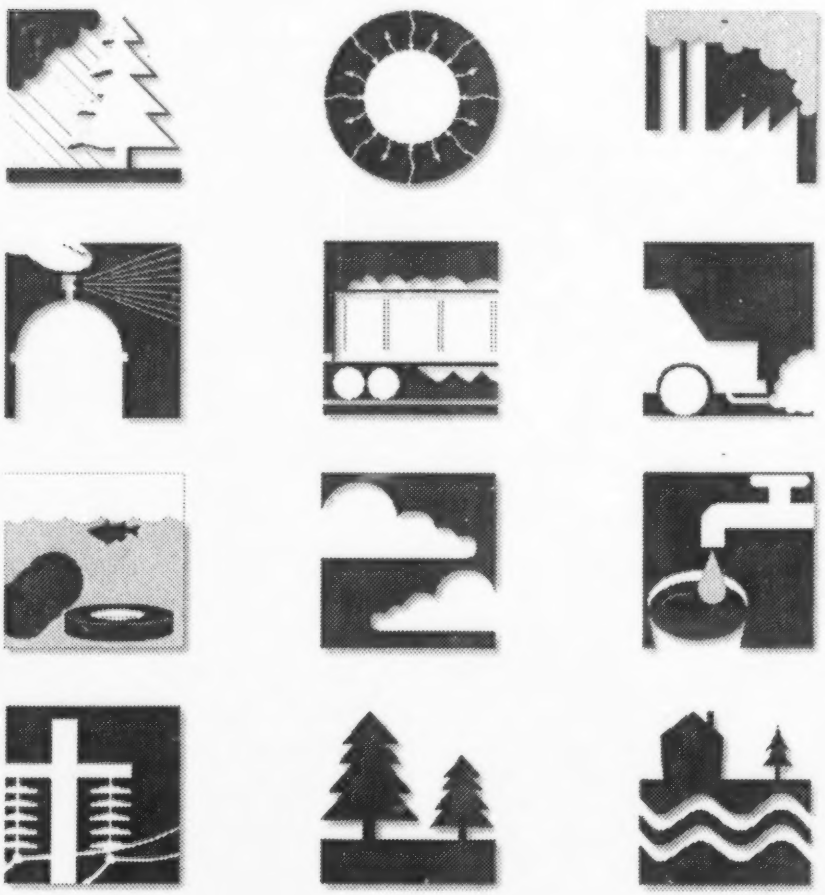
Many actions already under way are showing results, but a lot more needs to be done. Over the coming months, the government will announce further initiatives in its fight for cleaner air and a healthier climate, calling on every business, every organization, every municipality and every individual Ontarian to join the battle.

If you would like to find out more about how smog, acid rain and climate change are interrelated and how government approaches take advantage of these interrelations to achieve the maximum benefits for the environment, please visit our website at **www.ene.gov.on.ca.**

appendix

Ontario responds to air pollution and climate change

Selected air quality and climate change actions by the Ontario Government, Ontario businesses and institutions, and Ontario municipalities.



Ministry of Energy, Science, and Technology

The **Energy Efficiency Act** specifies minimum energy efficiency standards for 51 appliances and products sold in Ontario.	*This legislation led to an estimated 0.3 per cent reduction in Ontario's annual energy use, which is equivalent to an emissions reduction of 486,000 tonnes of carbon dioxide. These benefits are expected to triple by 2020.*
The **Energy Competition Act** created an open electricity market and opportunities for renewable energy sources and high-efficiency gas-fired generation to be brought on-stream. Generation projects relying on clean, low emitting generation sources amounting to $3 billion have been proposed since the passage of the Act.	*Ontario is opening its electricity system and giving green generators open access to sell their power. The Energy Competition Act encourages investment in clean power generation with greatly reduced or negligible greenhouse gas (GHG) emissions.*
Environmental Information Disclosure requires electricity retailers to inform consumers about their generation sources using an information label entitled "Electricity Facts".	*This tool enables electricity retailers to market power supplied from renewable sources, which emit negligible GHG, smog-related and toxic emissions.*
The **Energy Education Program** supports the preparation, translation and publication of web-based education material on energy conservation and renewable energy.	*This program provides information about the environmental benefits of energy efficiency and conservation to teachers and students, allowing them to make informed choices about energy use.*
Legislation reducing taxes for environmentally-friendly water power is expected to bring about new investments in hydro-electric generation estimated at $2 billion.	*Hydro-electric power stations emit negligible amounts of greenhouse gases.*
The **Energuide for Houses** provides a reliable means for home buyers to measure energy efficiency.	*Choosing energy-efficient housing will lower greenhouse gas and smog-related emissions.*

Ontario Ministry of Agriculture, Food and Rural Affairs

Agricultural Best Management Practices (BMPs) provide the farming sector with current technical advice on soil and water conservation, nutrient management and management of many GHG-producing agricultural activities. BMPs will focus on:	*This program will provide the incentives for greater adoption of BMPs by farmers. This will lower GHG emissions, but also protect soil and water quality.*
• **Farm Nutrient Management** initiatives aim to improve the storage, handling and application of agricultural nutrients (manure and fertilizers).	*More efficient use of nitrogen-based nutrients (manure and fertilizers) will reduce emissions of nitrous oxide and methane, two potent greenhouse gases.*
• **Reduced Tillage** results in less soil disturbance and helps to add more carbon from plant residues to the soil.	*Conservation tillage results in lower CO_2 emissions because of less soil disturbance and less fuel use, and increases the soil's ability to retain carbon – effectively and naturally storing GHG emissions in our soils.*

Ministry of the Environment

Administered in cooperation with the Ministry of Transportation, Ontario's **Drive Clean Program and Smog Patrol** make mandatory the testing and maintenance of vehicle emissions control systems.

Drive Clean is expected to cut carbon dioxide emissions by 100,000 tonnes annually, while also reducing smog-causing emissions from vehicles by 22 per cent when fully implemented.

New Landfill Standards require the collection of air emissions for large landfills with more than 250 million tonnes of waste capacity.

This emissions initiative will ensure that landfill gases – largely the potent greenhouse gas methane – will be captured and burned, or used as an energy source.

In **restructuring the electricity sector**, the Environment Ministry relies on **environmental regulations** to define emissions limits for all generators, along with emissions trading regulations. Further, environmental assessments are now required for public and private electricity producers.

All regulations that accompany the restructuring of Ontario's electricity sector aim to significantly reduce GHG and smog–causing emissions.

Ontario's **Anti-Smog Action Plan** includes current initiatives and possible future actions to reduce smog-causing emissions by 45 per cent.

Reducing smog-causing pollutants also reduces carbon dioxide emissions, which are among the main contributors to climate change.

The mandatory monitoring and reporting of CO_2 emissions – among other pollutants – was announced in January 2000. This requirement already applies to the electricity sector and will be expanded to other sectors in the future.

This program will provide consumers who want to purchase environmentally-friendly electricity and other products with the necessary information. Producers and manufacturers will have a marketing incentive to reduce the emissions associated with their products and services.

The Pollution Prevention Pledge Program (P^4)/Pollution Prevention Partnerships publicly reports on and recognizes achievements in pollution prevention by individual companies, organizations, municipalities, or governments.

To date, facilities participating in P_4 have reported annual GHG emissions reductions of 43,000 tonnes.

The Utility Bill Analysis/Industrial-Commercial Analysis service provides energy efficiency evaluation of a business location/plant through the Environment Ministry.

This service identifies opportunities for resource conservation which – if acted upon – will reduce GHG emissions and other air pollutants.

In partnership with various Ontario industry associations, the Environment Ministry has developed **Sector Initiatives for Resources Conservation and Clean Production.**

This initiative helped identify opportunities to reduce energy use and the resulting GHG emissions.

The Green Industry and Environmental Technology Development initiative is a series of government initiatives to assist Ontario environmental companies.

Assisting Ontario's green industries will enhance market awareness of environmental technology and lead to broad-based emissions reductions.

Through a **Refrigerants Regulation**, Ontario banned the release of haloflourocarbons (HFCs) used as refrigerants.

Limiting the release of haloflourocarbons, which are potent greenhouse gases, will have direct climate change benefits.

Ministry of Transportation

The Transportation Ministry's **Statement of Environmental Values (SEV)** under Ontario's Environmental Bill of Rights demands that all new significant policies and programs must be screened for environmental implications.

Screening for environmental implications will create an opportunity to identify potential GHG emissions before they occur.

Ontario's Shortline Railways Act makes it easier for companies to establish shortline rail operations.

Since 1996, eleven shortline railways have been established in Ontario, shifting freight loads from street to rail and keeping thousands of trucks off Ontario's roads.

Intelligent Transportation Systems (ITS) like the COMPASS integrated freeway traffic management program and the 407 Express Toll Route improve traffic flow on Ontario's busiest highways.

Eliminating vehicle idling and stop-and-go traffic dramatically decreases vehicle emissions.

Ontario's Transportation Ministry continues to build **Carpool Lots** adjacent to selected highway interchanges within commuting distance to large urban centres.

Carpool lots have the potential to increase the number of people per vehicle. They reduce the total number of vehicles and also total vehicle emissions.

Ministry of Natural Resources

Improved forest management and wood harvesting methods, introduced by Ontario's Ministry of Natural Resources, protect healthy forest growth and minimize damage through fires, diseases and insects.

This initiative increases the natural GHG absorption potential of Ontario's forests.

About 33 per cent of Ontario's total land area is covered by wetlands. **Ontario's Wetlands Program** aims to conserve and restore wetlands and forbids development on provincially significant wetlands south and east of the Canadian Shield.

Wetlands absorb significant amounts of greenhouse gases from our atmosphere. Their preservation will have direct air quality and climate change benefits.

Ministry of Northern Development and Mines

The Ontario Mining Act requires mining companies to complete reclamation on mining properties after they have closed.	*Most reclamation efforts result in regeneration of natural vegetation, which in turn helps reduce carbon dioxide emissions.*

Ministry of Municipal Affairs and Housing

Amendments to the Ontario Building Code:

• provide for more flexibility in meeting energy conservation requirements in large buildings.	*The amended Building Code allows designers and builders to introduce more cost-effective energy efficiency measures to reduce emissions from large buildings.*
• facilitate the construction of small apartments and mixed-use buildings on small-lot "Main Streets".	*Compact development and mixed-use development can reduce vehicle miles travelled, creating the potential for emissions reductions.*
• facilitate the use of recycled building materials.	*Using recycled materials eliminates energy use required to manufacture new materials, reducing GHG and smog-causing emissions.*
A Provincial Policy Statement promotes compact urban form, transit-supportive development densities, alternative development standards and mixed uses.	*All of the initiatives supported by the Provincial Policy Statement have the potential to reduce vehicle miles travelled along with CO_2 emissions.*
The ministry provided **Transit-Supportive Land Use Planning Guidelines** for city planners and designers.	*Transit-friendly cities reduce total vehicle emissions by promoting public transit use.*
The ministry developed and promoted **alternative development standards** to contain urban sprawl.	*This initiative has the potential to reduce commuter emissions by promoting compact urban form.*
The **Brownfields Initiative** promotes the re-use of real estate previously used by industry, reducing the need for greenfield development.	*Adaptive reuse of previously developed lands usually saves the cost of extending infrastructure but also limits vehicle travel and associated vehicle emissions.*

Climate Change and Air Quality Actions by Ontario Businesses and Institutions

Ontario Power Generation has spent $1 billion over the last decade to reduce emissions and currently produces the same amount of power from coal as it did ten years ago with 60 per cent fewer emissions of NOx and SO_2. OPG recently announced plans to spend another $250 million on pollution control equipment that would reduce smog-causing NOx emissions.

Ontario Power Generation produces 75 per cent of its electricity from sources that do not produce GHG emissions or emissions of NOx and SO_2. When its Pickering A units return to service, 85 per cent of generation will come from sources that do not release GHG or other air emissions.

The 3M Canada Company implemented energy conservation measures and changes to the manufacturing process.

Through these measures, 3M lowered its greenhouse gas (GHG) emissions by nearly 5 per cent between 1990 and 1998.

Ascolectric Limited reduced its natural gas consumption by 24 per cent between 1990 and 1997 using energy conservation measures like low-power lighting and improved insulation.

Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.

Atlas Specialty Steels Inc. installed a refining converter, computerized boiler controls and upgraded car furnaces. These and other measures reduced energy use per unit of production by 1.4% between 1990 and 1998.

Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.

Bayer Inc. Rubber Division is conducting an ongoing and comprehensive energy conservation program.

Overall, Bayer Inc. was able to lower its CO_2 emissions by 21 per cent between 1990 and 1998.

Boeing Toronto Ltd. implemented energy-saving measures such as changing lighting and ventilation. The company also installed a co-generation facility, producing heat as a by-product of electrical generation.

Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.

The Chinook Group installed oxygen monitors on boilers to improve combustion efficiency. The company also recycled hot condensate from steam to heat equipment and buildings.

Chinook reduced its greenhouse gas emissions at one of their facilities by nearly 5 per cent between 1994 and 1998.

Crown Cork and Seal Canada Inc. has implemented process and product changes such as converting their forklift operations from propane to natural gas.

Between 1991 and 1998, the company increased its energy efficiency ratio, thus reducing GHG emissions from energy generation.

Cuddy Food Products Inc. used a combination of energy conservation measures and process changes to improve energy efficiency.

Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.

Dow Chemical Canada Inc. implemented a number of energy conservation measures.	*The company reduced CO_2 emissions from operations by 22 per cent between 1990 and 1998.*
DuPont Canada Inc. brought in a nitrous oxide abatement system at its nylon plant and introduced energy conservation measures. The company is also involved in fuel cell research and plans to have renewable sources account for 10 per cent of its energy supply by 2010.	*At its nylon plant, DuPont abated over 50 per cent of its nitrous oxide emissions in 1998. They company also reduced its energy consumption by 20 per cent between 1992 and 1998. Overall, DuPont achieved significant emissions reductions – 10,000,000 tonnes of carbon dioxide equivalents a year at one facility alone.*
Enbridge Consumers Gas introduced process changes such as replacing older cast iron pipes to reduce leakage. The company is also committed to reducing GHG emissions through demand-side initiatives (e.g., programmable thermostats) and has installed a solar wall on its Toronto fleet garage.	*Enbridge achieved a 19 per cent reduction of GHG emissions from 1990 to 1998. The use of solar wall technology resulted in annual GHG reductions that are equivalent to 25 tonnes of CO_2.*
Fabrene Inc. has introduced a number of energy conservation measures, reducing its energy consumption by 27 per cent between 1990 and 1998.	*Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.*
Falconbridge Ltd. dramatically reduced energy consumption for air compression and underground ventilation.	*Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.*
Humber College of Applied Arts and Technology introduced energy conservation measures such as the extension of a building automation system and a lighting retrofit.	*By 1997, the college had reduced its GHG emissions by 2.5 per cent over 1990 levels.*
IBM Canada Ltd. implemented conservation efforts such as manufacturing process changes, improved lighting and better HVAC control.	*IBM reduced energy use by 36 per cent between 1990 and 1998 and lowered its CO_2 emissions by 32 per cent during the same period.*
Imperial Oil (Esso) has introduced energy conservation measures and manufacturing process changes.	*The company reduced its annual GHG emissions by 15,000 tonnes between 1990 and 1998.*
Interface Flooring Systems (Canada) Inc. uses certified green energy to meet 25 per cent of its energy needs. The company also educated both employees and the public about the importance of reducing GHG emissions.	*Using green energy sources reduces the amount of GHG emissions generated by fossil fuel power plants.*
Ivaco Rolling mills made energy efficiency improvements such as installing a new natural gas fired reheat furnace and a heat recuperator that utilizes waste heat.	*By 1998, Ivaco had reduced energy consumption by 23 per cent over 1990, thus reducing its energy-related GHG emissions.*

Kodak Canada Inc. has – among other energy-saving measures – established a co-generation facility and implemented a lighting retrofit and building automation measures.	*Since 1990, the company has been able to reduce its GHG emissions by 13 per cent.*
La Cite Collegiale has introduçed a building automation system and a number of other energy reduction measures.	*As of 1999, La Cite Collegiale had reduced its GHG emissions by 23 per cent over 1995 levels.*
Metroland Printing, Publishing and Distributing has implemented a host of energy conservation actions, including light motion sensors and a building automation system.	*The company was able to reduce its GHG emissions by 15 per cent between 1990 and 1997.*
Nexfor Inc. has introduced a comprehensive fuel substitution program.	*Fuel switching has led to a 23 per cent average reduction in Nexfor's GHG emissions since 1990.*
Orenda Aerospace Corporation has brought in a variety of energy conservation measures, including a boiler and a lighting retrofit.	*Orenda reduced its GHG emissions by over 3 per cent between 1990 and 1999.*
The Ottawa-Carleton District School Board reduced its GHG emissions from its 150 schools through a combination of fuel substitution, energy conservation and process measures.	*Overall, energy use and emissions were reduced by 15 per cent from 1998 to 1999.*
Royal Bank of Canada is involved in an ongoing lighting retrofit at its 400 branches.	*Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.*
Spruce Falls Inc. combined process changes, fuel substitution and equipment modernization to reduce GHG emissions.	*GHG emissions were reduced by over 45 per cent since 1990.*
St. Lawrence Corp. made process changes and implemented fuel substitution, energy conservation and process changes based on an energy evaluation.	*The company has reduced GHG emissions by 13 per cent between 1990 and 1999.*
Toronto Dominion Centre Leaseholds Limited used lighting and air conditioning retrofits and organized an energy management group.	*Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers.*
The University of Western Ontario used cogeneration to provide heat and reduce the amount of purchased peak demand energy.	*Cogeneration can improve the efficiency of fuel use and reduce total emissions.*
Westcoast Energy Inc. has modernized equipment in its Ontario subsidiaries Union Energy, Union Gas and Westcoast Power Generation.	*In its Union Gas subsidiary, the company reduced GHG emissions by 25 per cent per million cubic metre. Westcoast Power Generation reduced its GHG emissions by 18 per cent per gigajoule of energy.*

Air Quality and Climate Change Actions by Ontario Municipalities

The City of Hamilton and Region of Hamilton-Wentworth The Hamilton Street Railway Company currently operates 38 clean-running compressed natural gas buses.	*CO_2 emissions from buses fueled by compressed natural gas are about 20 per cent lower than those from diesel-fuelled buses. Carbon monoxide, fine particulate and nitrogen oxides emissions are also substantially lower.*
The City of Ottawa introduced a comprehensive Building Retrofit Program, along with street lighting conversions and a more efficient use of city fleets.	*In 1999, the City of Ottawa reported a 19 per cent reduction in its GHG emissions and an 18 per cent reduction in energy use from 1990 levels.*
The City of Peterborough participates in the city's Green-Up program, which offers household evaluations of energy, waste and water use and recommends lifestyle changes to use resources more efficiently.	*Improved energy efficiency reduces GHG emissions generated by some of Ontario's electricity providers*
The City of London has improved waste management practices and completed a comprehensive energy conservation project in city buildings.	*Through waste management improvements, London has reduced GHG emissions by 19 per cent from 1995 to 1999. The city's building retrofit/update program lowered GHG emissions by almost 6,000 tonnes per year.*
The City of Windsor is currently implementing a comprehensive water and energy efficiency program for city buildings.	*Windsor's energy efficiency efforts will reduce the city's total carbon dioxide emissions by roughly 480 tonnes.*
The City of Cornwall built the first co-generation system in southern Canada with a capacity to produce heat as a by-product of electrical generation.	*Cogeneration energy plants can lower fuel consumption and GHG emissions by up to 30 per cent.*
The City of Perth has introduced a variety of GHG initiatives under the ecoPerth banner: Timers on Christmas lights, a tree planting program and a community retrofit initiative all have considerable GHG benefits.	*Perth's tree planting program spares Ontario's air of at least 70 tonnes of carbon dioxide a year. The city's retrofit initiative will result in estimated carbon dioxide emissions reductions of 21,000 tonnes.*
The City of Sudbury has initiated a Land Reclamation Project to restore areas previously used by industry. Over 3,200 hectares have been restored and over 5.5 million trees planted.	*Estimated overall carbon dioxide emissions reductions will be about 70,000 tonnes a year.*

Mississauga is implementing 36 Air Quality Action Plans to address GHG and smog-causing emissions.

As of 1998, Mississauga's GHG emissions for a select building group had decreased 17 per cent from their 1990 level.

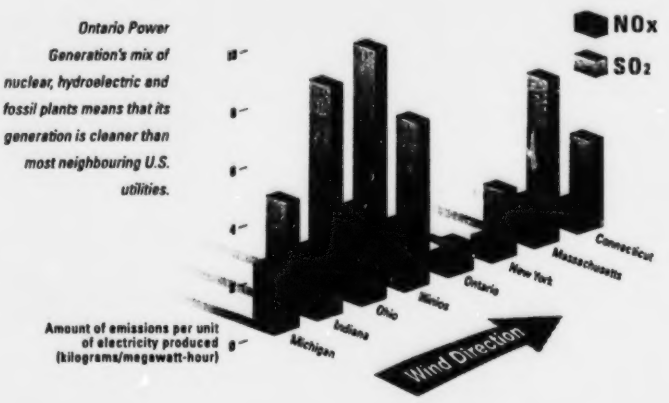
The City of Toronto has commissioned power developers to use landfill methane emissions to generate electricity. The city is also involved in ongoing and comprehensive building retrofit programs such as the Better Building Partnership.

The use of landfill methane for power generation eliminates the same amount of GHG emissions a million cars would produce in a year. Toronto's building retrofit programs are expected to reduce CO_2 emissions by 40,000 tonnes in their first year alone.

Source: Ontario Power Generation

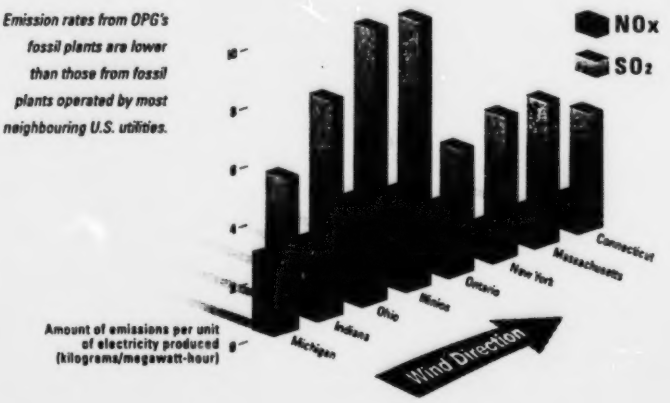
OPG Emission Rates Compared to U.S. Utilities

U.S. Environmental Protection Agency data for 1998, compiled by Clean Air Corporation



OPG Fossil Plant Emission Rates Compared to U.S. Utilities

U.S. Environmental Protection Agency data for 1998, compiled by Clean Air Corporation



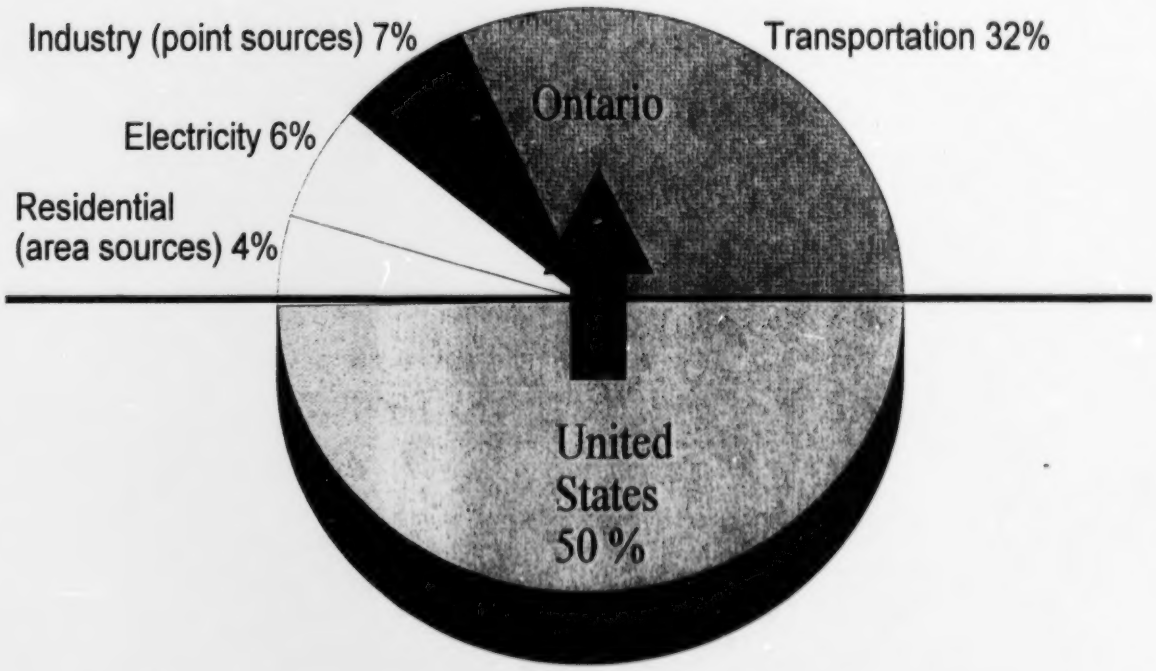
Source: Ontario Ministry of Energy, Science and Technology

Emissions from Electricity Generation

	Ontario 1998 (OPG)	Ontario 1999 (OPG)	Ohio 1998	Michigan 1998	Indiana 1998	Illinois 1998	New York 1998
TWh	126	138	148	101	118	139	145
NOx tonnes NO	55800	51600	316464	176865	292212	217088	76898
SO2 tonnes	143000	142400	1193612	372777	728321	630365	243076
NOx/kWh grams/kWh	0.44	0.41	2.14	1.75	2.48	1.56	0.53
SO2/kWh grams/kWh	1.13	1.13	8.06	3.69	6.17	4.54	1.68

Transboundary Air Flow into Ontario
Halifax
Kejimkujik
Montreal
Ottawa
Boston
New York
Philadelphia
Charleston
Norfolk
Charlotte
Atlanta
Charleston
Savannah
Miami
New Orleans
50% of Ontario Smog Originates in the United States
Annual emissions of nitrogen oxides from electrical generating stations*
150,000 tonnes
75,000 tonnes
15,000 tonnes
*Shown for eastern states and provinces only
Prevailing winds during smog season
CANADIAN GEOGRAPHIC MAY/JUNE 2000
SOURCES: NATURAL RESOURCES DEFENSE COUNCIL ("BENCHMARKING AIR EMISSIONS OF ELECTRIC UTILITY GENERATORS IN THE EASTERN U.S."); ENVIRONMENT CANADA; HEALTH CANADA; ONTARIO POWER GENERATION; NOVA SCOTIA POWER; POLLUTION PROBE; ONTARIO CLEAN AIR ALLIANCE; ONTARIO MEDICAL ASSOCIATION; DAVID SUZUKI FOUNDATION

Ontario: Sources of Smog



More than half of the smog affecting Ontario comes from the United States

*Smog representation based on nitrogen oxide emissions.